

# PATENT SPECIFICATION

698,643



Date of filing Complete Specification : July 21, 1952.

Application Date : May 28, 1951. No. 12501/51.

Complete Specification Published : Oct. 21, 1953.

Index at Acceptance :—Class 83(iii), D1b11.

## COMPLETE SPECIFICATION.

### Improvements in or relating to Drilling Jigs.

We, THE DE HAVILLAND AIRCRAFT COMPANY LIMITED, a British Company, of Hatfield, Hertfordshire and DENNIS STUART HITCHINS, a British Subject, of 52, Oaktree Dell, Kingsbury, London, N.W. 9, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement :—

The present invention relates to drilling jigs to facilitate the drilling of lines of holes for the subsequent reception, for example, of rivets. The invention has been more particularly devised for use in the aircraft industry, and more specifically for use in connection with the drilling of rivet holes in panels, such as those forming the surface skin, for their fixture to their supporting ribs of the body frame.

In drilling such rivet holes it is often necessary to drill a line of holes for a given number of rivets between two points at a given distance apart, and it has been customary to divide such distance by the number of rivets to give the spacing between adjacent rivets and then to mark out the drilling points consecutively by hand at the calculated distance apart. It is found in practice, however, that a very small difference in the rivet spacing sums up to a relatively large amount when a long line of rivets is in question, with the result that it is often difficult to fit in the proper number of rivets at uniform spacing. In some cases the number of rivet holes is too many or too few, or the spacing between the last two rivet holes of the line is too large or too small.

The setting out of the rivet holes is also rendered more difficult, when, as in the case of fixing the skin of an aircraft body, the panel to be riveted in position is curved instead of being flat.

The object of this invention is to provide a simple jig with the aid of which a given number of holes can be drilled at a substan-

tially uniform distance apart along a line of given length, the device being variable to suit the required number of rivets and the required length of the line of rivet holes, and the spacing between holes being fixed automatically by the setting up of the device with the number of holes and length of the line along which they are to extend.

A drilling jig in accordance with the present invention comprises a metal or other supporting strip or mount having a longitudinal slot with which is associated a strip of rubber or other elastic material and a plurality of equally spaced metal bushes constituting drilling guides carried by said elastic strip, the latter being extensible lengthwise of the slot to increase the spacing of said bushes as required.

According to another aspect of the invention the drilling jig comprises a metal strip or mount having a longitudinal slot, a series of metal bushes constituting drilling guides mounted in said slot so that they are free to slide lengthwise thereof, but are constrained by the edges of the slot against angular and lateral displacement, said bushes being carried by a rubber or other elastic strip and uniformly spaced apart, said elastic strip being extensible lengthwise of the slot, to increase the spacing of said bushes as required.

In order that the invention may be clearly understood and readily carried into effect the invention is hereinafter described with reference to the accompanying drawings in which :

Figure 1 is a plan view of a drilling jig in accordance with the invention :—

Figure 2 is a side elevation of the same ;

Figure 3 is a fragmentary longitudinal section on an enlarged scale ;

Figure 4 is a fragmentary cross-sectional view ;

Figure 5 shows the drilling jig in use.

In a preferred embodiment of the invention the drilling jig comprises a metal supporting strip 1 constructed from thin spring steel or

[Price 2s. 8d.]

Price 2s.

Price 4s 6d

other material which will permit of the strip being bent in a longitudinal direction, this being particularly desirable when it is desired to drill a curved panel or other component part. The strip is formed with a longitudinally arranged slot 2 which is enlarged at one end as at 3 for a purpose hereinafter referred to. Mounted in the slot 2 are a plurality of metal, for example, steel bushes 4 each formed with an axial boring 5 of a diameter slightly greater than the holes which are to be drilled which bushes constitute drilling guides during the drilling operation. The bushes 4 are carried by a strip of natural rubber, synthetic rubber or other suitable elastic material, this strip being indicated generally by reference numeral 6. It is preferred that the bushes 4 shall actually be moulded into position in the strip 6 and with this object in view they are formed with one or more parts 7 of reduced diameter into which the rubber can flow during the moulding operation.

As will be seen clearly from Figures 1 and 2 the strip of elastic material 6 will lie on the upper surface of the supporting strip 1 all the bushes being equally spaced apart throughout its length or throughout substantially the whole of its length. The bushes 4 are freely slidable lengthwise of the slot 2 and are constrained against lateral and angular movement. One method of accomplishing this is to form each bush with two annular flanges 8 which lie above and below the strip 1 and overlie the edges of the slot 2. This is illustrated clearly in Figure 4. Furthermore, as the lower flange 8 will lie below the strip 1 it is preferred that the flanges 8 on the bush 4 shall be maintained out of contact with the work and with this object in view the strip 1 carries two strips 9 of rubber or other comparatively soft material on its under surface, the strips 9 being bonded or otherwise secured in position. The thickness of the strips 9 is a little greater than the thickness of the flanges 8 and consequently the latter will be maintained just clear of the work.

Instead of mounting the bush 4 in the slot 2 the latter may be of greater width in which case the longitudinal edges of the elastic strip 6 may be formed with grooves into which the metal on opposite sides of the slot 2 can enter so as to hold the elastic strip 6 in position on the supporting strip 1 to permit of extension of the former along the slot 2 as and when required.

As it may be desired to remove the elastic strip and its associated bushes 4 from the strip 1 and to replace these components by an elastic strip carrying bushes which are formed with borings of a different diameter, the slot 2 may, as previously mentioned, be formed with an enlargement 3, this enlargement 3 being of sufficient diameter to permit of entry of the bushes into the slot in a longitudinal direction. It will be appreciated that in the

case of an elastic strip which is formed with longitudinally arranged grooves in its edges for engagement with the component 1, the enlargement 3 will necessarily be of a width sufficient to permit the longitudinal entry of the elastic strip 6 into the slot.

Figure 5 shows the manner in which the drilling jig is used.

Holes are first drilled in the work in the normal manner at the beginning and end of the line of holes to be drilled. One of the endmost bushes in the strip 6 is then registered with one of the end rivet holes and a locating pin 10 is inserted through the bush and into the drilled hole. If then, for example, holes for forty rivets are to be drilled the fortieth bush counting from and including the first bush whose position has already been fixed is registered with the other end hole already drilled in the work and is located by a second locating pin 11, the elastic strip being necessarily extended in the process to bring the fortieth bush into register with the second hole. The strip 6 will in consequence of this procedure have become extended and the intermediate bushes of the strip between the two already located will be drawn apart until they have taken up positions at equal distances apart distributed uniformly or substantially uniformly along the required line and for the required distance along that line. The intermediate bushes will then be used as drilling guides for the drilling of the work to receive rivets or other fastening devices.

In Figure 3 the drilling jig is shown applied to a curved workpiece such as, for example, part of an aircraft wing, the strip 1 by virtue of its flexible nature conforming closely to the curvature of the panel or skin which it is desired to rivet in position.

It will be readily understood that any desired number of bushes may be selected for distribution along a line of any given length within the limits imposed by the elasticity of the rubber or similar strip 6. For example, it is anticipated that an extension of some 50% will be obtainable which will permit of a corresponding variation in the spacing of the drilled holes.

By so constructing the strip 1 that its associated elastic strip and bushes can be easily removed if and when desired a single supporting strip or mount may be provided with a number of interchangeable rubber strips having bushes formed with bores of different diameters. Furthermore, although it is preferred to make the strip 6 from natural or synthetic rubber it may be composed of any other suitable material having the desired elastic properties. As shown the steel bushes do not extend completely to the one end of the strip 6, the part not so provided with bushes being capable of being gripped by the fingers when extending the strip to locate the selected bush with the

second hole which has been previously drilled.

What we claim is :—

1. A drilling jig comprising a metal or other supporting strip or mount having a longitudinal slot with which is associated a strip of rubber or other elastic material and a plurality of equally spaced metal bushes constituting drilling guides carried by said elastic strip, the latter being extensible lengthwise of the slot to increase the spacing of said bushes as required.

2. A drilling jig comprising a metal strip or mount having a longitudinal slot, a series of metal bushes constituting drilling guides mounted in said slot so that they are free to slide lengthwise thereof, but are constrained by the edges of the slot against angular and lateral displacement, said bushes being carried by a rubber or other elastic strip and uniformly spaced apart, said elastic strip being extensible lengthwise of the slot to increase the spacing of said bushes as required.

3. A drilling jig as claimed in Claim 1, wherein the elastic strip is formed with a longitudinal groove in each of its edges for entry by the edges of the slot in the supporting strip.

4. A drilling jig as claimed in Claim 1 or 2, wherein the bushes are mounted in the slot in the supporting strip and are formed with spaced peripheral flanges which by their engagement with the upper and lower surfaces of the strip adjacent the slot locate the said bushes in position against angular or lateral displacement but permit of sliding movement

lengthwise of the slot when the elastic strip is extended.

5. A drilling jig as claimed in any of the preceding claims, wherein the supporting strip is composed of thin spring steel or other material which will permit it to bend in a longitudinal direction.

6. A drilling jig as claimed in any of the preceding claims, wherein the bushes are moulded into position in the elastic strip.

7. A drilling jig as claimed in any of the preceding claims, wherein the supporting strip carries on its under surface two strips of rubber or other comparatively soft material adjacent its longitudinal edges and of a thickness such that the bushes will be held clear of the work which it is desired to drill.

8. A drilling jig as claimed in any of the preceding claims, wherein one end of the slot in the supporting strip is enlarged to facilitate removal of the bushes and their associated elastic strip and their replacement by a strip, the bushes of which are drilled to a different diameter.

9. A drilling jig constructed, arranged and adapted to operate substantially as and in the manner hereinbefore described with reference to the accompanying drawing.

Dated this 21st day of July, 1952.

For the Applicants :  
F. J. CLEVELAND & COMPANY,  
Chartered Patent Agents,  
29, Southampton Buildings,  
Chancery Lane, W.C.2.

#### PROVISIONAL SPECIFICATION.

#### Improvements in or relating to Drilling Jigs.

65 We, THE DE HAVILLAND AIRCRAFT COMPANY LIMITED, a British Company, of Hatfield, Hertfordshire, and DENNIS STUART HIRCHINS, a British Subject, of 52, Oaktree Dell, Kingsbury, London, N.W.9, do hereby  
70 declare this invention to be described in the following statement :—

The present invention relating to drilling jigs to facilitate the drilling of lines of holes for the subsequent reception, for example of  
75 rivets. The invention has been more particularly devised for use in the aircraft industry, and more specifically for use in connection with the drilling of rivet holes in panels, such as those forming the surface skin, for their  
80 fixture to their supporting ribs of the body frame.

In drilling such rivet holes it is often necessary to drill a line of holes for a given number of rivets between two points at a given  
85 distance apart, and it has been customary to divide such distance by the number of rivets to give the spacing between adjacent rivets

and then to mark out the drilling points consecutively by hand at the calculated distance apart. It is found in practice, however, that a very small difference in the rivet spacing sums up to a relatively large amount when a long line of rivets is in question, with the result that it is often difficult to fit in the proper number of rivets at uniform spacing. In some cases the number of rivet holes is too many or too few, or the spacing between the last two rivet holes of the line is too large or too small.

The setting out of the rivet holes is also rendered more difficult, when, as in the case of fixing the skin of an aircraft body, the panel to be riveted in position is curved, instead of being flat.

The object of this invention is to provide a simple jig with the aid of which a given number of holes can be drilled at a substantially uniform distance apart along a line of given length, the device being variable to suit the required number of rivets and the

required length of the line of rivet holes, and the spacing between holes being fixed automatically by the setting up of the device with the number of holes and length of the line along which they are to extend.

According to the invention the device comprises a metal supporting strip or mount having a longitudinal slot with which is associated a strip of india rubber which can be extended along the slot for various distances, and along this rubber strip are mounted at equal distances apart a plurality of tubular steel bushes having a bore slightly exceeding the diameter of the holes to be drilled. In using the device holes are first drilled in the normal manner at the beginning and end of the line of holes to be drilled in the panel to be riveted; one of the end bushes carried by the rubber strip is then registered with one of these end rivet holes and a fixing pin inserted through the bush into the hole. If then, for example, holes for 40 rivets are to be drilled, the fortieth bush counting from and including the first bush whose position has already been fixed is registered with the other end hole already drilled in the panel and fixed by another fixing pin. In consequence of this procedure the rubber strip becomes extended and the intermediate bushes of the rubber strip between the two already fixed will be drawn apart until finally they take up positions at equal distances apart, distributed uniformly, or substantially so along the required line and for the required distance along that line. They can then be used as guides for the drilling of the panel for subsequent riveting or bolting.

As will be readily understood, any desired number of bushes may be selected for distribution along a line of any given length, within the limits imposed by the elasticity of the rubber forming the extensible strip carrying the bushes. For example, it is anticipated that an extension of some 50% will be obtainable, which will permit of a corresponding variation in the spacing of the rivet or other holes.

According to a further feature of the invention, the metal supporting strip or mount for the rubber strip may be of thin spring steel, so that it is flexible, thus enabling the device to conform to a curved surface, such as that

for a panel intended to form a convex or concave surface.

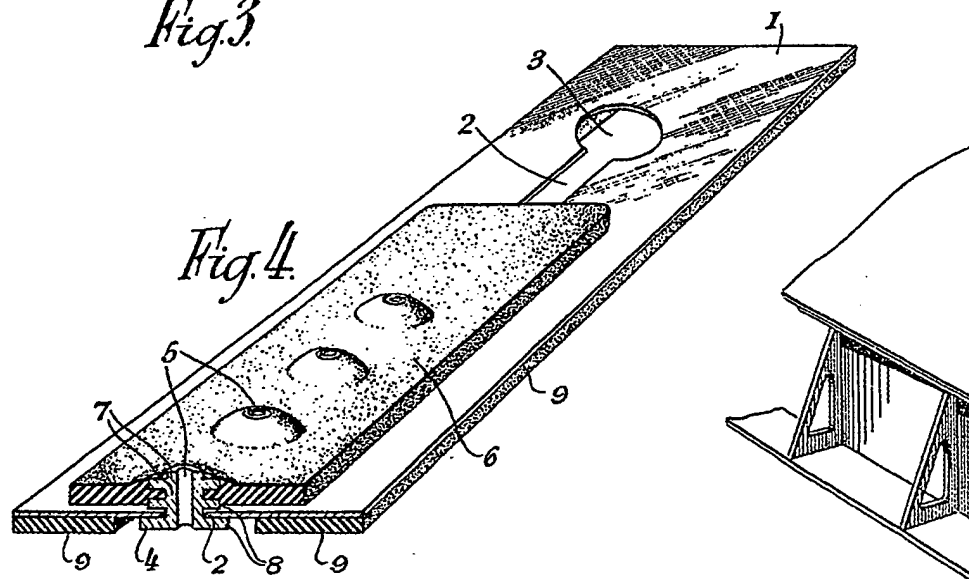
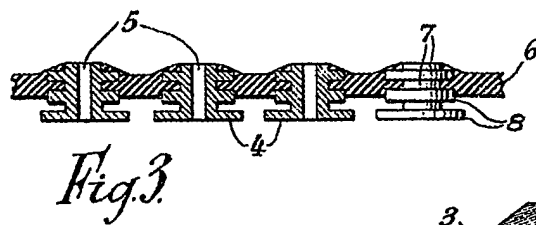
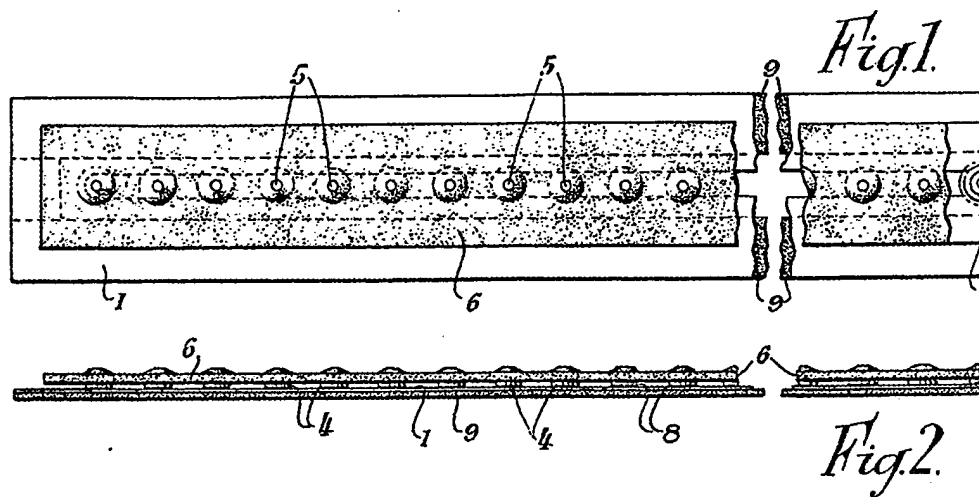
In carrying the invention into practice the steel bushes may have a pair of circumferential collars or flanges for engagement with the side edges of the slot in the supporting strip or mount, and the bushes are preferably moulded into a strip of india rubber, which lies along the surface of the supporting strip or mount. Since the lower ends of the bushes will project below the surface of the supporting strip or mount on its under surface, strips of rubber or other suitable material of the requisite thickness may be affixed to the said under surface along each side of the slot to serve as a spacing means raising the bushes just clear of the surface of the panel to be drilled.

According to a modified construction, instead of engaging between flanges on the bushes, the edges of the slot may engage directly in longitudinal slots along the edges of the rubber strip, in which case no flanges or collars need be provided on the bushes mounted in the rubber strips.

In order to allow for the drilling of holes of different sizes, instead of providing a number of different adjustable jigs having bushes with bores of different diameters, a single supporting strip or mount may be provided with a number of exchangeable rubber strips, having bushes with bores of different diameters, and to permit removal and fitting of the appropriate rubber bush carrying strip in the mount as required, one end or both ends of the slot may open into a hole of a diameter or size exceeding the width of the rubber strip, or the diameter of the collars or flanges on the bushes at which point or points the rubber strip may be fitted to the supporting strip or mount.

Various modifications in the device may be made, other than the foregoing; for example, instead of mounting the bushes in an india rubber strip they may be mounted in any kind of strip having similar properties of extension, e.g. a strip made of suitable plastic material.

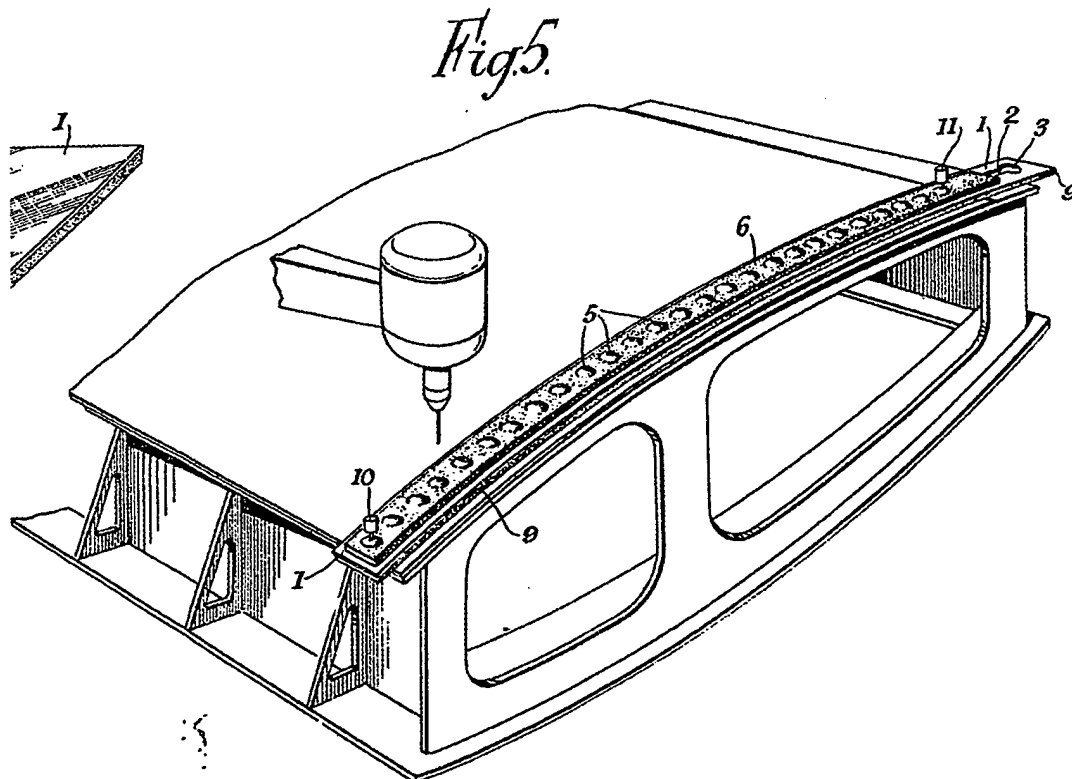
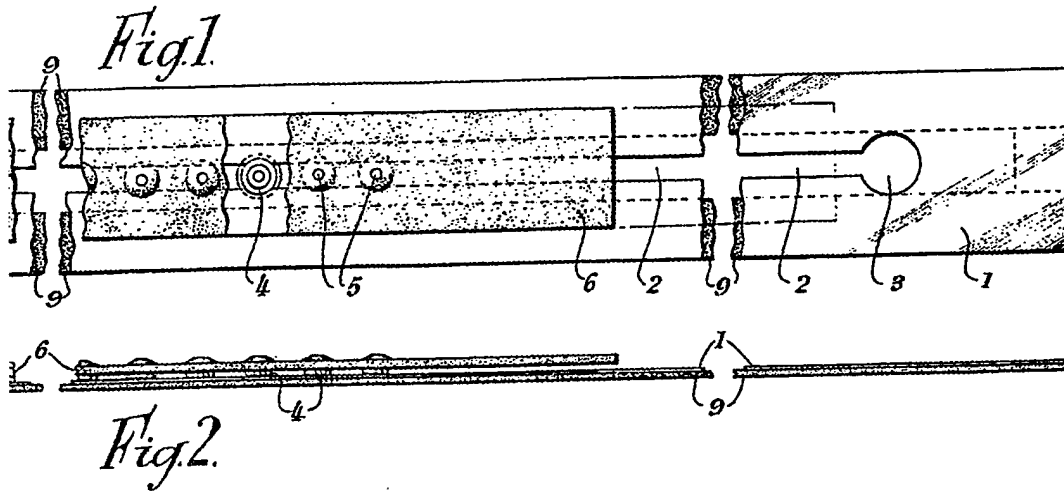
F. J. CLEVELAND & COMPANY,  
Chartered Patent Agents,  
29, Southampton Buildings,  
Chancery Lane, W.C.2.



698,643 COMPLETE SPECIFICATION

1 SHEET

This drawing is a reproduction of the Original on a reduced scale.



698,643 COMPLETE SPECIFICATION  
 1 SHEET  
 This drawing is a reproduction of  
 the Original on a reduced scale.

